

GROUND BASED MEASUREMENTS OF COLUMN AMOUNTS OF NO₂ OVER SYOWA STATION, ANTARCTICA (ABSTRACT)

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Column amounts of NO₂ have been measured using visible spectroscopy at Syowa Station (69°S) from March 1990. The NO₂ slant column amount at a solar zenith angle (SZA) of 90° exhibits a large seasonal variation, reaching a minimum of $1 \times 10^{16} \text{ cm}^{-2}$ or less in midwinter, and increases to a maximum of $17 \times 10^{16} \text{ cm}^{-2}$ in midsummer. The recovery of NO₂ in spring is 2–3 times slower than the fall decay. The observed temperature indicates that PSCs are expected to form from midwinter to early spring. A decrease in ozone was observed from early August and continued to the end of September, consistent with the observed depletion in NO₂ during the same period. A chemical box model has been used to quantitatively interpret these observed results. The observed NO₂ values in fall are in agreement with the box model including only gas phase chemistry or with heterogeneous chemistry on background sulfuric acid aerosols. In addition, the very low NO₂ amounts and slow rate of increase observed from midwinter to early spring agree well with the model results assuming heterogeneous chemistry of PSCs. From the late spring of 1991, the NO₂ amounts are lower by more than 30%, presumably due to the increased rate of conversion of NO_x into HNO₃ via N₂O₅ on the enhanced amount of sulfuric acid aerosols resulting from the Pinatubo eruption. The reduction of NO₂ in midsummer of 1991 and 1992 below that of midsummer in 1990 is probably due to the transport of air from lower latitudes, where NO₂ is already reduced by the volcanic aerosols. NO₂ and O₃ values in October 1992 were much reduced as compared with those for 1990 and 1991, reflecting the difference in the location of the vortex boundary relative to Syowa Station.

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